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The OCRWM Enterprise

• MAY 1998 •

A PUBLICATION OF THE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT (OCRWM)

In This Issue...

Cross-drift Excavation Heralds New Phase in Site Characterization

Workers are excavating a 2.8 kilometer cross-drift (pictured left of the main drift) that will cross over the main loop of the Exploratory Studies Facility. Inside the cross-drift, scientists will study properties of the rock and the behavior of water near the potential repository area.

In December 1997, miners and scientists began work on a project called the Enhanced Characterization of the Repository Block (ECRB). The ECRB study involves excavating a 2.8- kilometer (1.6-mile) cross-drift tunnel that traverses the mountain from northeast to southwest. Inside the cross-drift, scientists will study properties of the rock and the behavior of water near the proposed repository area. Data also will be collected to verify models and predictions about the geology surrounding the cross-drift.

A five-meter- (16.5-foot) diameter Tunnel Boring Machine (TBM) began excavating the cross-drift on March 31, 1998 (see TBM article). The new TBM required the construction of a launch chamber located approximately 1,992 meters (6,535 feet) inside the North Portal of the Exploratory Studies Facility (ESF). Once excavation is completed this fall, the drift will cross over the main loop of the ESF, overlap the proposed repository area, and intersect the Solitario Canyon Fault.

Excavation of the cross-drift will provide researchers new opportunities to study the geologic profile of the rock in the proposed repository. Geologists will map the cracks, fractures and faults, and collect rock samples. They will compare the actual conditions to those they expected to find in the cross-drift.

According to Russ Dyer, Acting Yucca Mountain Site Characterization Office Project Manager, "Scientists

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A Message from the Acting Director

In the months ahead, OCRWM will continue some of the world's most advanced scientific work as we approach the program's biggest milestone to date. Expected to be completed this fall, the Yucca Mountain Viability Assessment will help to define further examinations of whether the site will be suitable for permanent geologic disposal of the Nation's commercial spent nuclear fuel and high-level radioactive waste.

Now that the five-mile main loop of the underground Exploratory Studies Facility (ESF) has been completed, our investigations are focused on key remaining uncertainties about the Yucca Mountain site.

One such investigation involves the excavation of a cross-drift tunnel that will cut through the potential repository block, giving us a more complete three-dimensional view of Yucca Mountain. This will provide a better understanding of the basic rock structure, including fractures and faults. Excavation of the cross-drift began on March 31, 1998, 3 weeks ahead of schedule.

Our thermal testing program is also well under way. Four separate thermal tests will allow us to explore how the rock and fluids in the repository system will behave in the presence of heat generated by spent nuclear fuel and high-level radioactive waste.

On December 3, 1997, the heaters were activated in the Drift-Scale Heater Test nearly 1,000 feet below the surface of Yucca Mountain. This milestone was completed ahead of schedule and marks the culmination of an integrated effort over the past 2 years involving science, construction, design and engineering. The Drift-Scale Test is the largest of several heater tests at Yucca Mountain, and for that matter, is the largest underground thermal test ever conducted anywhere in the world.

Two alcoves in the ESF have been isolated from ventilation effects to allow scientists to monitor humidity and seepage during the high precipitation from El Niño. To date, no seepage has been observed in any of the testing areas.

Underground construction of a test facility at Busted Butte near Yucca Mountain was completed in February 1998, ahead of schedule. Tests at this facility are being

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You are also invited to use the many features of the OCRWM Home Page at:

http://www.rw.doe.gov

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International Conference Featured In-depth Tour of Yucca Mountain

The 8th International High-Level Radioactive Waste Management Conference was held May 11-14, 1998, in Las Vegas, Nevada. The conference provided an international forum for the discussion of scientific, technical and societal issues related to transporting, receiving, storing, and disposing of radioactive waste. Conference attendees from around the world shared information across programmatic, disciplinary, and international boundaries.

The conference was sponsored by the American Nuclear Society (ANS), University of Nevada—Las Vegas, OCRWM, the Organization of Economic Cooperation and Development's Nuclear Energy Agency, and numerous professional and technical societies, national laboratories, and commercial and Federal organizations throughout the world.

In addition to a full schedule of presentations by some of the world's leading experts on nuclear waste management, conference organizers offered attendees an in-depth technical tour of the Yucca Mountain Site Characterization Project. Tour attendees talked with Project scientists and learned the latest information about current and future studies at Yucca Mountain.

Tour attendees also traveled to the crest of Yucca Mountain to learn more about the geology, hydrology, and environmental aspects of the mountain. Other tour highlights included the Exploratory Studies Facility where ongoing activities and excavation work was observed, and the Field Operations Center where exhibits are kept on display representing various aspects of the project.

Copies of the conference proceedings may be purchased for $90.00. To purchase copies, you may contact Sue Cook, ANS Accounting, at 708-579-8210. ■

OCRWM Releases Revised Draft RFP for Waste Acceptance and Transportation

Dwight Shelor, Acting Director of the Office of Waste Acceptance, Storage and Transportation announced the release of a revised draft Request for Proposals (RFP) in December 1997 for the acquisition of commercial spent nuclear fuel (SNF) acceptance and transportation services. Mr. Shelor stated that "with the release of this revised draft RFP, OCRWM is continuing its contingency planning efforts and maintaining dialog with affected parties to assure that we are positioned to initiate transportation activities in support of DOE's mission as quickly as possible." He also noted that this draft RFP reflects public review and consideration of comments from industry, utilities, States and other interested parties based on a December 1996 draft RFP and a pre-solicitation conference held in February 1997.

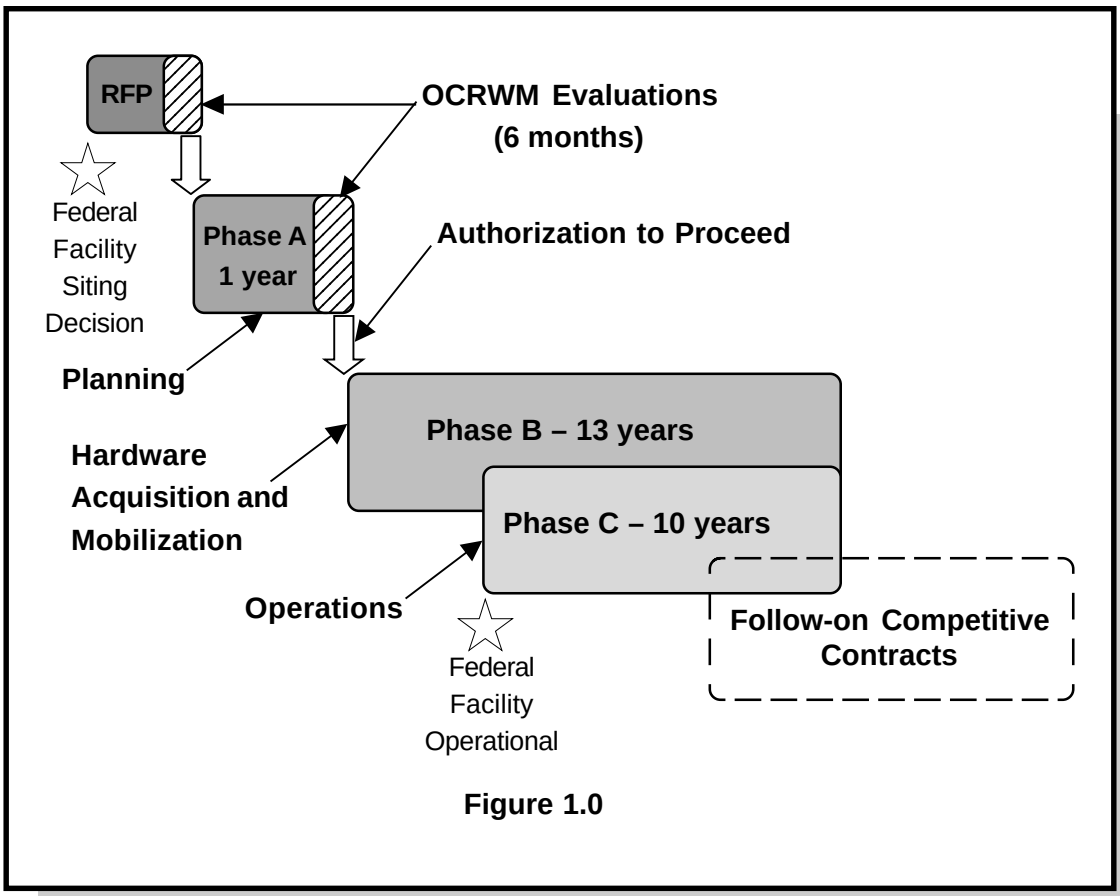

Figure 1.0

The draft RFP can be found on the OCRWM Home Page at **http://www.rw.doe.gov** under the heading "Waste Acceptance, Storage and Transportation."

Draft RFP Strategy Overview

OCRWM's proposed contracting approach is intended to capitalize on the strengths of the private sector, using its innovative powers, to help DOE accomplish its mission objectives. OCRWM intends to pursue the procurement strategy outlined in the draft RFP whether or not the OCRWM program includes interim storage. The concept described in the draft RFP provides for OCRWM to purchase services and equipment from a contractor-operated waste acceptance and transportation organization. The contractors are expected to acquire operational equipment, establish the necessary management organization, and mobilize the necessary resources and capabilities to provide the SNF delivery services at a fixed rate. DOE will retain final approval of all routes and maintain primary responsibility to the States, Tribes, and local units of government for assuring appropriate interaction and consideration of their input.

The draft RFP performance structure is based on a three-phased approach as described on page 12. The total potential contract term is approximately 14 years. OCRWM anticipates that before the end of the initial Phase C contract period new competitive contracts will be awarded for continuing the servicing activities.

OCRWM expects that multiple contracts for Phase A activities will be awarded. Phase A deliverables will enable OCRWM to assess the ability of potential contractors and to determine which Regional Services Contractors (RSCs) will be authorized to proceed into Phase B. To achieve OCRWM's objectives and to provide the capability to respond to contingencies, the contiguous United States

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Busted Butte Tests Important to Viability Assessment and Licensing Process

Workers survey the walls of the Busted Butte test facility where scientists are studying the movement of simulated radionuclides in the Calico Hills formation of Yucca Mountain.

Busted Butte is a small mountain located at the southern end of Yucca Mountain. Researchers are working there to study the movement, or transport, of radionuclides in the unsaturated zone. This is the rock layer above the water table.

Tests are being conducted in the rocks of the Calico Hills formation, a non-welded (soft) and non-fractured volcanic tuff. This rock formation also lies within Yucca Mountain between the potential repository horizon and the water table. Scientists believe it to be the principal barrier to radionuclide movement through the unsaturated zone.

In late January, miners finished excavating an 83-meter (272-foot) adit (entry tunnel) and test alcove at Busted Butte. This facility will house the unsaturated zone transport tests. Workers completed excavation 6 days ahead of schedule, and began drilling test boreholes.

Phases I and II of the Busted Butte transport tests will use non-radioactive tracers designed to mimic the movement of real radionuclides. Laboratory tests using real and simulated radionuclides will be performed concurrently at the Los Alamos National Laboratory. Scientists will compare results from the combined field and laboratory tests with data from the field tests conducted in the Calico Hills. These tests will show how actual radionuclides may behave under the proposed repository.

Miners excavated an entry tunnel and test facility at Busted Butte, a small mountain located at the southern end of Yucca Mountain. Unsaturated zone transport tests will take place in the Calico Hills formation.

According to Dr. Gilles Bussod, principal investigator for the Project, "the goal of the Busted Butte Field Test is to assess radionuclide movement in the unsaturated zone at Yucca Mountain in a compressed amount of time."

The testing at Busted Butte will take place in three phases: In Phase I, scientists will inject tracers into 10.2-centimeter- (4-inch) diameter boreholes two-meters (6.3-feet) long. As the tracers move away from their point of injection, scientists will drill larger boreholes around the small holes to monitor the tracer movement in the rock.

In both Phases I and II, scientists also will inject microspheres to mimic colloid movement, and to simulate the movement of radionuclides bound to colloids, through fractured and unfractured unsaturated rock. A colloid is a very small mineral particle, such as silica, clay or a man-made

material. This study will address how the Calico Hills rocks work as a barrier to downward movement by colloids and simulated radionuclides in the unsaturated zone.

Phase II testing will occur in an underground test block approximately 10 by 10 by 5 meters (33 by 33 by 16.5 feet) in dimension. Researchers will use 7.5-meter- (25-foot) long tracer injection boreholes, and 10-meter- (33-foot) long collection boreholes below them.

The test block has two exposed faces, one in the main adit and one in the test alcove. During Phase II, scientists will compare their three-dimensional flow and transport model predictions to actual flow paths in the test block. The Busted Butte test will produce a three-dimensional view of tracer and colloid movement through the rock and fractures of Calico Hills. This movement will be monitored in real time using several geophysical techniques. Afterward, workers will excavate into the test block to determine the actual tracer movement.

The Phase III tests will be configured similarly to the Phase II tests. These tests will be designed to identify possible fast-flow routes downward during periods of increased rainfall. The tests also will address the effect of water chemistry and thermal changes in the rock that could be expected during operation of the repository.

When scientists finish the transport field tests at Busted Butte, they will better understand the movement of radionuclides and colloids through the unsaturated zone at Calico Hills. Scientists can then prepare the regulatory documents for a more accurate assessment of Yucca Mountain as a potential multi-barrier repository. ■

Regional Radioactive Waste Transportation Committees Meet to Address National Issues

More than 150 stakeholders attended a joint meeting of the Regional Radioactive Waste Transportation Committees, December 9-11, 1997, in Las Vegas, Nevada.

The committees represent States interested in Department of Energy (DOE) transportation programs and include the Southern States Energy Board, the Council of State Governments Midwestern Office, the Council of State Governments Eastern Regional Conference, and the Western Interstate Energy Board.

DOE officials gave the committees program updates, followed by panel discussions and breakout sessions focusing on various transportation issues. A tour of Yucca Mountain and its Exploratory Studies Facility was offered to attendees on the last day of the meeting.

OCRWM's Acting Director, Lake Barrett, provided an overview of the OCRWM program, describing the latest accomplishments at Yucca Mountain, and offering updates on the status of utility litigation, legislation, and the repository Viability Assessment, expected this fall. He also addressed future decision points such as a repository site recommendation and the licensing process.

Dwight Shelor, Acting Director, Office of Waste Acceptance, Storage and Transportation, summarized OCRWM's latest draft Request for Proposals for the acquisition of commercial spent nuclear fuel acceptance and transportation services (see *OCRWM Releases Revised Draft Request for Proposals...*on page 3).

Eugene Schmitt, Deputy Assistant Secretary, Office of Environmental Management, presented an update on the National Transportation Program, covering an approach to coordinated transportation planning.

Acting Deputy Director Susan Shankman of the Nuclear Regulatory Commission's Spent Fuel Project Office described her agency's role in regulating shipments of spent nuclear fuel. Additional speakers provided updates on the Waste Isolation Pilot Plant and foreign spent nuclear fuel shipments.

Discussions among committee members and other stakeholders focused primarily on three areas: consistent planning and coordination among the DOE's various transportation programs, privatization of certain program elements, and the route selection process.

From these discussions, the regional committees are developing a report that will address these important coordination issues and serve as valuable input for DOE.

To get more information about these four regional committees and other OCRWM cooperative agreement groups, go to the *Related Web Sites* section of the OCRWM Home Page at **http://www.rw.doe.gov.** ■

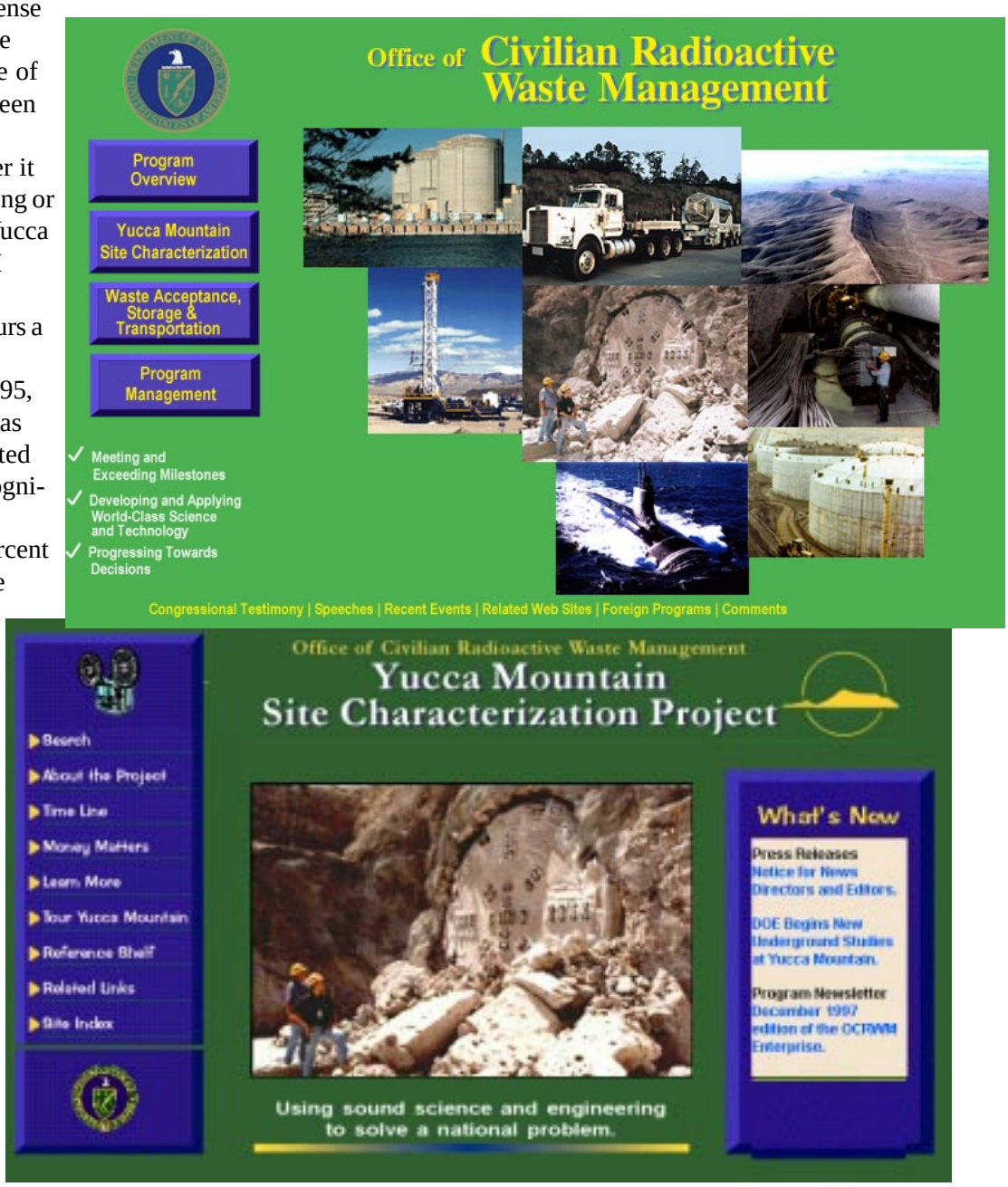
OCRWM Home Page is Tops and Getting Better

Capitalizing on the immense popularity of the Internet, the OCRWM Home Page is one of the ways the program has been made more accessible to its many stakeholders. Whether it is announcing a public meeting or describing progress at the Yucca Mountain site, the OCRWM Home Page is on the job providing information 24 hours a day.

Since going on-line in 1995, the OCRWM Home Page has become one of the most visited Internet sites, achieving recognition by one rating service as being among the top five percent of all sites. The Home Page currently averages about 2,000 visits per week.

The Home Page provides the public with access to a wealth of information about the program, including simplified explanations of program concepts, program plans, annual reports, fact sheets, technical reports, notices about upcoming meetings, news releases, photographs, and video tours of Yucca Mountain.

A major program milestone to be completed this fall, the Yucca Mountain Viability Assessment will be available on the Internet soon after its release, with all relevant technical and scientific references to follow soon thereafter.



OCRWM's Home Page and its Yucca Mountain Site Characterization Project section have a fresh new look and more features. Web browsers can access the latest program information, submit comments and request publications.

The Home Page is also an excellent source for members of the public to learn what others may have to say about key program developments and milestones. Public comments currently found on the Home Page address the repository environmental impact statement, the *Revised Proposed Policy and Procedures for the Safe Transportation of Spent Nuclear Fuel and Emergency Response Training,* and the *Revised Draft Solicitation for Waste Acceptance and Transportation Services.*

Another useful feature of the Home Page allows users to request OCRWM publications and videos free of charge through the on-line document-ordering system. Publication requests are promptly processed and are usually delivered within a week of the request.

Because the Home Page has become such a frequently used information resource, OCRWM is making its Home Page even more user-friendly and updating its appearance. Pull-down menus on the front

page and navigation buttons on all pages have been added to make it easier to find a particular item.

Reorganization of information was also necessary, because the volume of material available to the public has grown to more than 3,000 pages. New features to be added later in the spring include a more simplified public comment capability, a full text search button, and a site map.

Because the OCRWM Home Page is dynamic and always being updated with new information, public feedback is important. Comments and suggestions regarding the information available on the Home Page system are appreciated, and the system's mailbox option can be used to send OCRWM a message.

The Home Page can be found on the Internet at **http://www.rw.doe.gov**. To get answers to questions on how to access the system, or to learn more about the Home Page, contact the OCRWM National Information Center toll-free at 1-800-225-6972. In Washington, D.C., call (202) 488-6720. ■

OCRWM Addresses Public Comments in Repository Environmental Impact Statement Process

The Office of Civilian Radioactive Waste Management (OCRWM) has compiled hundreds of public comments in its analysis of the possible environmental impacts of building, operating, and eventually closing a repository for spent nuclear fuel and high-level radioactive waste at Yucca Mountain, Nevada.

In 1995, OCRWM invited interested persons to participate in defining the scope of the repository Environmental Impact Statement (EIS). Input was specifically solicited from Federal, State, and local government agencies, Native American Tribal organizations, public interest groups, transportation interests, industry and utility organizations, regulators, and members of the general public.

OCRWM held 15 public scoping meetings across the country between August and October 1995 to allow interested parties to present verbal and written comments. The scoping period officially closed December 5, 1995. More than 700 people attended the 15 scoping meetings where 242 participants offered comments. More than 500 written comments were received.

In Fiscal Year 1996, Congress significantly reduced funding for work at Yucca Mountain. As a result, OCRWM deferred a number of Yucca Mountain Project activities, including efforts related to the preparation of the EIS. EIS preparation, including review of the public comments, was not resumed until funding was restored in Fiscal Year 1997.

As a result of the public scoping process, OCRWM is performing additional impact studies in such areas as transportation, socioeconomic conditions, and health and safety. Specific comments and information on how OCRWM is addressing them are provided in the Summary of Public Scoping Comments, published in July 1997. A free copy can be obtained by calling 1-800-867-3477.

Since the scoping meetings, OCRWM continues to apprise public and oversight groups of the repository EIS status. Officials with the State of Nevada and other affected units of government attended briefings on five separate occasions during 1997.

In addition, the National Environmental Policy Act Project staff gave repository EIS updates to Native American Tribes, the Nuclear Waste Technical Review Board, the Nuclear Regulatory Commission, the U.S. Air Force, the U.S. Navy, the National Park Service, and the American Nuclear Society. More briefings are planned throughout 1998.

In a January 1998 presentation to affected units of government, Wendy Dixon, Assistant Manager for Environment, Safety and Health at the Yucca Mountain Site Characterization Project, explained the scope of the EIS and how it will support a site recommendation decision by the Secretary of Energy.

According to Ms. Dixon, the EIS must "be comprehensive in considering potential impacts to human health and the environment. Public input has been extremely helpful in establishing the bounds of our analysis."

To prevent duplication of efforts, OCRWM has integrated EIS program activities with other studies at Yucca Mountain. As much as possible, the EIS, Viability Assessment, and license application efforts draw from common data collected from site characterization activities. Yucca Mountain Project scientists also gather data and perform analyses that are unique to the EIS.

In 1998, OCRWM is continuing to analyze potential environmental impacts associated with various repository and transportation scenarios. The next milestone date in the EIS process is July 1999 when a draft EIS will be available for public review. ■

Researchers Turn up the Heat on Yucca Mountain Rock

In December 1997, researchers at Yucca Mountain, Nevada, switched on the most extensive of four types of thermal tests of Yucca Mountain rock. The Drift-Scale Test, together with the other thermal tests, is designed to show how heat from spent nuclear fuel and high-level radioactive waste will affect nearby rock.

Laboratory Tests

Researchers have been conducting laboratory-scale thermal tests of Yucca Mountain rock at several national and private scientific facilities since the start of the Yucca Mountain Site Characterization Project. In these experiments, small blocks of rock are heated for short amounts of time. Researchers study these blocks in the laboratory under highly-controlled conditions. The latest series of thermal laboratory tests, which helped set the stage for the larger field tests, is slated to continue throughout the duration of these field tests.

Project managers check data collected from the Single-Heater Test in Alcove 5 of the Exploratory Studies facility.

Data from these laboratory tests provide a basis from which to design progressively larger heat tests held under less controlled and increasingly realistic conditions. Prolonged heat causes mechanical, hydrological, chemical, and thermal changes in rock. The controlled laboratory setting made it possible for researchers to isolate these individual processes, study their interactions, and then build models showing how the rock might perform in nature. These models are refined through subsequent field and laboratory studies. Researchers, thereby, moved from small-scale to larger-scale tests, from simpler to more complex tests, and from tests of short duration to tests lasting many years.

Large Block Test Examines Rock Under Field Conditions

The Large Block Test moved thermal studies out of the laboratory and into the field. The test is taking place on the surface, near Yucca Mountain. Scientists carved out a 3- by 3- by 4.5-meter (10- by 10- by 15-foot) block of rock from the same geologic formation as that proposed for a repository. Heating of the block began in February 1997. The cooling phase began in February 1998.

In this test, the block of rock was covered with insulation and vapor seals designed to catch any moisture that moves through the rock during heating. Five 3-meter-long electrical heaters with a combined output of 2,250 watts supplied heat. After the rock cools, the block will be taken apart and samples will be collected. Scientists will study their samples for changes to the rock's chemistry, as well as for the presence of any microbiological organisms. Such organisms could, under certain conditions, potentially corrode waste canisters.

Single-Heater Test Looks at Rock's Response Underground

The Single-Heater Test began in August 1996. The electric heaters were turned off in May 1997, and the cool-down phase was completed in January 1998. In this test, researchers heated an approximately 20-cubic-meter (26-cubic-yard) volume of rock to more than 100 degrees Celsius (212 degrees Fahrenheit). The heat also affected an additional 1,600 cubic meters (2,093 cubic yards) of nearby rock. Unlike previous thermal tests, this one took place in a test alcove 300 meters (984 feet) below the surface of the mountain.

Designed as a prelude to the final Drift-Scale Test, the Single Heater Test allowed researchers to more

closely recreate some of the conditions that would be found in a repository. In this test, scientists used a copper-wrapped electrical heater some 10 centimeters (4 inches) in diameter, and roughly the length of a standard flagpole, and inserted it into a borehole drilled near the center of the test block. Three hundred thermal sensors were used to monitor temperatures hourly during the experiment.

Canisters are used to simulate repository emplacement containers in the Drift-Scale Test. There are 30 electric heaters within each canister. This test will span 8 years.

Drift-Scale Test Examines Near-Repository Conditions

Scientists designed the Drift-Scale Test, which began in December 1997, to approximate the thermal conditions anticipated in a functioning repository. Previous thermal tests examined progressively bigger volumes of rock under conditions that were increasingly more difficult to control.

This newest test will be the largest experiment in the multi-year study of heated rock, and involves heating an area of rock surrounding a 48-meter- (156-foot) long tunnel in Alcove 5 of the Exploratory Studies Facility. The heat will be generated by 9 canisters, each containing 30 single-element heaters, and another 50 heaters placed in borholes extending into the rock. The tunnel segment is roughly the same size and shape as those that would store waste packages in a repository.

The tunnel walls will be heated to temperatures of up to 200 degrees Celsius (392 degrees Fahrenheit). Heat radiating further into the rock will include an area of about 10,000 cubic meters (13,000 cubic yards), reaching an average temperature of 100 degrees Celsius (212 degrees Fahrenheit). To a lesser degree, the heat will affect another 200,000 cubic meters (260,000 cubic yards) of nearby rock.

The heated drift has been insulated from the rest of the alcove. Remote video and infrared cameras will permit researchers to visually monitor the sealed drifts. Some 4,000 sensors installed in the surrounding rock will help scientists monitor the various kinds of anticipated heating effects.

Scientists will collect and evaluate data from the Drift-Scale Test and other thermal tests for several years. The knowledge gained will result in better assessments of the potential repository's long-term performance. ■

A data display board shows the total power used, the total power cost, heater hours and a representative canister temperature in the heated drift. The Drift-Scale Test is heating a tunnel segment to temperatures of up to 200 degress Celsius (392 degrees Fahrenheit), simulating the temperatures expected in a geologic repository.

El Niño Helps Scientists Study Water Movement at Yucca Mountain

El Niño, or "The Little One" in Spanish, is a weather phenomenon that begins around Christmas time every 2 to 7 years. Unusually warm water in the Pacific Ocean disrupts normal weather patterns around the globe and dramatically increases rainfall across the Americas.

"The last major El Niño in 1995 caused the wettest winter on record since the 1930s, and this year's El Niño is developing in a similar way," said Dr. Allen Flint, research hydrologist for the Yucca Mountain Project.

According to Dr. Flint, during the El Niño events monitored in 1992, 1993, and particularly in 1995, some of the greatest amounts of rainfall ever recorded seeped into Yucca Mountain.

Project scientists have found that during these large El Niño events, water flow may have penetrated deeper within the mountain than during normal climate conditions. This happens as water is taken up by soils immediately above fractures, or natural breaks in the rock, and then begins to move down the fractures.

Because the fracture network in the mountain cannot store water, rainfall can continue down into the mountain. Scientists know that it is critical to understand how water may reach the potential repository through the fault and fracture systems of the mountain. Too much water could create dripping conditions in a repository, possibly affecting its performance.

El Niño's visit this year provides researchers an excellent opportunity to test theories and perfect computer models that show how the natural flow systems in the mountain work. On December 12, 1997, testing for El Niño's impact began in Alcove 7 of the Exploratory Studies Facility. The entire alcove contains the same type of rock, but the adjacent Ghost Dance Fault is of another rock type. Scientists sealed the back and middle portions of the alcove to isolate the Ghost Dance Fault from the effects of mine ventilation and to let the rock settle back to its natural moisture condition.

Near the roof of Alcove 7, a specially-treated cloth was placed beneath the fracture system and close to the Ghost Dance Fault to detect any drips that may come from the fracture or fault zone.

Once scientists determine which fractures are leaking, they will drill holes into the fractures and collect water to determine its age. Scientists need to know the water's age in order to design accurate computer models and gain a better understanding of how and when the water moved into the mountain.

Scientists have placed instruments on the surface of Yucca Mountain above Alcove 7, as well. These instruments measure the wetness of the soil in the fault zone just above the hard, consolidated rock called bedrock.

Such measurements will help scientists understand how the increased precipitation from El Niño collects in the soil and moves into the bedrock near the surface; this is of particular interest near a fault like Ghost Dance.

Project hydrologists also want to understand how water spreads out from the faults and fractures into the surrounding rock pores. Instruments were set up in a zone 66 feet away from the Ghost Dance Fault in a non-fault zone. Drip cloths are being used to detect water drops, should any occur. Some scientists predict that water will not drip but move slowly, pore to pore, around and through the walls of the alcove.

Scientists want to compare the degree of wetness occurring in the fault zone and non-fault zone over the same time period. So far, tests show rock to be wetter near the fault zone, indicating that water moves more through fractures and faults and less through rock pores.

Another study is taking place at Alcove 1. Here, scientists are replicating the effects of El Niño at the mountain's surface and are monitoring its effects 131 feet below. Instruments were placed underground just as in Alcove 7. Only here, an instrument on the surface of the mountain delivers water at a rate and in an amount similar to those encountered during an El Niño event.

Scientists will determine how quickly the water can penetrate the surface of Yucca Mountain, move into the fracture network, and drip, if at all, into the alcove. A drip collection system will collect the water for chemical analysis.

A tracer, or chemical marker, will allow scientists to differentiate between the delivered water and water that may have been in the mountain for many years. This test will tell scientists how the mountain's system behaves under controlled conditions, and will also show how flow occurs near the mined opening.

Project scientists would like to determine the time frame for water to move from the surface to the proposed repository depth. Tests in both alcoves will also help scientists better understand when, and how often, peak flows occur, and how much water moves deep into the mountain.

So, as "The Little One" plays havoc with the rest of the world, Yucca Mountain's Project scientists are using El Niño's visit to southern Nevada as an excellent opportunity to gain a better understanding of the mountain's hydrologic system. ■

Smaller Tunnel Boring Machine Begins Big Excavation Job at Yucca Mountain

The 5-meter Tunnel Boring Machine (TBM) is prepared for the cross-drift excavation. The 225-ton machine was used to excavate portions of the Texas SuperCollider tunnel. Once completed, the excavation will make it possible for scientists to conduct vital tests in determining Yucca Mountain's suitability as a repository.

Geologists now know a great deal about conditions within the proposed repository block largely because of the Exploratory Studies Facility (ESF) excavated deep under Yucca Mountain. This tunnel was excavated with a 7.6-meter- (25-foot) diameter Tunnel Boring Machine (TBM).

Data from the ESF have helped scientists improve mathematical models of conditions underground, but researchers need to know whether these models accurately describe conditions in other parts of the potential repository block as well. This requires a further series of tests to be conducted in a new, 2.8-kilometer (1.6-mile) excavation called a "cross-drift."

The cross-drift will cross over the main drift of the ESF, overlap the proposed repository area, and intersect the Solitario Canyon Fault.

Though not as complex or extensive as excavating the main tunnel of the ESF, the job requires a TBM that approximates the dimensions of actual disposal drifts. This requires a smaller-diameter TBM.

The Yucca Mountain Project found the TBM it needed in Nebraska, a 5-meter- (16 foot, 5-inch) diameter machine that excavated portions of the Texas SuperCollider. The TBM cost approximately $4.5 million. After some refurbishing, the TBM began arriving at the mountain in pieces in mid-February1998. Construction personnel completed reassembling the TBM, and excavation began on March 31, 1998. Excavation should be completed in about 6 months.

According to Richard C. (Dick) McDonald, site construction manager, the new TBM does not require many of the special features built into the earlier machine. The new tunnel will be smaller in diameter and shorter than the main drift in the ESF.

"We have added a couple of features," said McDonald. "We've increased the filtering and ventilation system on the TBM to handle the dust produced during excavation. We have a new cutterhead that is better suited to the rock we are going to encounter. The cutters can be changed from the TBM side of the head instead of in front of the machine. This is a much safer way to change the cutters."

The TBM's smaller size offers excavators several advantages McDonald hopes will make for "an easier and smoother tunneling operation." The new TBM will create a tighter arch, resulting in rock at the top remaining stable. Workers also will be able to place any ground support that is needed in the tunnel more quickly, due to the TBM's shorter length.

The new TBM is designed to reduce disturbance to the surrounding rock during excavation and, therefore, produce a stable opening. Nozzles built into the new head will spray water to control dust. Dust that does result will be captured in place and removed with filters or carried out by the conveyor belt.

TBM Specifications

Diameter – 5 meters (16 ft., 5 in.)
Weight – 225 tons
Cutterhead horsepower – 1,200
Cutterhead speed – 10 rpm

McDonald is optimistic the new TBM will do its job safely and on schedule. "If we hit any significant bad ground at all," he said, "this will probably happen as we cross the Solitario Canyon Fault." ■

Revised Draft RFP *Continued from page 3*

is divided geographically into four Servicing Regions analogous to the four Nuclear Regulatory Commission (NRC) regions. OCRWM anticipates that release of the final RFP will be made soon after a national siting decision for a Federal facility is made. Phase B activities will not start until all requirements of the National Environmental Policy Act have been completed.

The draft RFP incorporates a number of specific operational details and enhancements that go beyond those that currently exist in the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste set forth in 10 CFR Part 961 "Standard Contract." The Department plans to take necessary actions to modify the Standard Contract accordingly. We believe that these enhancements will allow all parties to more effectively and efficiently schedule waste acceptance activities.

Contract Description

RSCs will provide waste acceptance and transportion services for commercial SNF in three contract phases. Figure 1.0 provides a graphical depiction of the procurement activities, including identification of the phases and phase sequencing.

Phase A - Planning

Phase A, which will last one year, includes the development of overall management and operational plans. Offerors may bid individually on any or all of the regions. Only Offerors who are awarded Phase A contracts will be eligible to proceed into Phase B and C activities. An Offeror may be selected in Phase B to service up to two regions.

A Transportation Plan will be developed which will establish the basic operational guidelines to be followed in subsequent Phase B mobilization and Phase C operations. Purchaser Site Servicing Plans for all Purchaser sites within a respective Servicing Region will also be developed. Information developed during preparation of the Servicing Plans will be used to determine an annual, site-specific, fixed rate, in cost per fuel assembly for each site being serviced during the first three years of Phase C. Planning will also be performed for remaining sites to the degree necessary to define out-year fixed prices.

An RSC will develop a Regional Servicing Plan which integrates site specific operational schedules into a Regional Servicing Schedule reflecting the final annual delivery schedules. The site specific schedules developed between DOE and individual Purchasers will be used as the basis for coordinating Purchaser site mobilization activities, finalizing equipment acquisitions, obtaining NRC route approval, completing carrier contracting, and focusing communication and outreach activities.

DOE will use the route and shipment schedule information to begin implementation of the requirements set forth in Section 180 (c) of the Nuclear Waste Policy Act of 1982, as amended. The four Regional Servicing Schedules will be integrated on an annual basis into a comprehensive master waste acceptance schedule in cooperation with the Federal Facility Operator, RSCs, and DOE.

Phase B - Mobilization

Phase B will last approximately 13 years. Key activities in Phase B include finalization of Regional Servicing Plans, acquisition of all key equipment, mobilization of designated Purchaser site resources and equipment, DOE and NRC approval of routing, and establishment of logistics, security and escorts, tracking, and emergency response support capabilities. Communication and outreach activities will include timely interactions with State, Tribal and local government representatives. DOE will exercise a lead role with State, Tribal and local units of government in institutional interactions and will retain the final approval of routing. Also the RSCs must successfully perform pre-startup and operational readiness demonstrations. Equipment acquisition, Purchaser site mobilization and training, refresher training, and interactions will continue during Phase B, consistent with both Site and Regional Servicing Schedules, in parallel with Phase C operations.

Phase C - Operations

Phase C will last 10 years and begins after the third year of Phase B, once the Federal facility is operational. The RSCs will begin SNF acceptance at designated Purchaser sites in accordance with its Regional Servicing Plan with subsequent transport to the Federal facility. Coincident with the SNF acceptance and transport, the RSCs will provide appropriate storage modules to the Federal facility so that suitable storage modules are ready for use at the Federal facility when the SNF is delivered.

The RSCs will also continue communication and outreach activities; maintain equipment licenses and permits; and pay all permit fees and other costs associated with maintaining operational readiness. RSCs will operate emergency support and general information hot lines, and operate the continuous, real-time tracking system for all shipments. ■

Transportation Group Works to Ensure Coordination

The Transportation External Coordination Working Group (TEC) held its thirteenth semiannual meeting January 20-22, 1998, in Las Vegas, Nevada. More than 150 participants met to address a variety of issues related to the Department of Energy's (DOE) radioactive materials transportation activities.

TEC is the primary external coordination mechanism established by DOE to provide continuing and improved coordination between OCRWM and other DOE elements, other government organizations, and outside entities with responsibility for, or interest in, DOE transportation activities.

TEC members include personnel from various DOE programs, including OCRWM and the Office of Environmental Management (EM); national and regional organizations representing State, Tribal, and local governments; professional associations; and industry organizations.

The TEC meeting comprised both plenary sessions and smaller breakout sessions. Discussions in the plenary sessions included the status of EM program integration efforts and an overview of the National Transportation Program, which is now managed jointly by Headquarters, the Albuquerque Operations Office, and the Idaho Operations Office. Also, a panel of industry representatives discussed railroad shipments of foreign research reactor spent nuclear fuel and Naval spent nuclear fuel. TEC has formed four topic groups to work on issues related to funding and technical assistance, rail transport, routing, and medical training issues. Each topic group gave a report to the full membership.

The funding and technical assistance group recommended that the best alternative to distributing assistance to States and Tribes would be a combined DOE grant with consistent training requirements for safe routine transportation and emergency response training.

The rail transport group reported its conclusion that new inspection standards for rail radioactive materials shipments are not needed because rail regulations already incorporate many of the inspection requirements recently developed for truck shipments of radioactive materials.

Lisa Sattler of the Council of State Governments – Midwestern Office, and Dave Crose of the Indiana State Emergency Management Agency discuss the next topic of a TEC Working Group session.

The routing topic group reported on its discussion paper entitled *Routing Issues Related to U.S. Department of Energy Radioactive Materials Transportation: Discussion and Analysis*. The paper, still under development, contains three major recommendations: (1) DOE should develop and implement a standardized, cooperative approach to route selection; (2) DOE should involve all stakeholders in the routing process; and (3) DOE should submit the final version of the report to interested parties within DOE, other Federal agencies, and Congress.

The medical training issues group reported that it is presently developing definitions of "core competency" by job classification for emergency responders.

The meeting included three breakout sessions that addressed transportation planning; the EM 2006 Plan; Section 180(c) of the Nuclear Waste Policy Act of 1982, as amended; emergency management and training assistance; routing and rail issues; and an extensive discussion of the OCRWM draft Request for Proposals for waste acceptance and transportation services.

TEC members were given an opportunity to either tour the Nevada Test Site or take a day trip to Yucca Mountain. There was also an optional training session on radioactive materials basics for emergency responders.

The next TEC meeting is scheduled for July 13-15, 1998, in Milwaukee, Wisconsin. A summary of the January 1998 meeting and further information about the July 1998 meeting has been posted on the TEC web site at **http://www.uetc.org/tec**. A copy of the TEC summary is also available by contacting the OCRWM National Information Center at 1-800-225-6972 (202-488-6720 in the Washington, D.C., area). ■

Acting Director's Message *Continued from page 2*

conducted to validate laboratory data and models, while reducing uncertainties in predictions about the transport of key radionuclides from the potential repository area to the water table underlying Yucca Mountain.

Progress is also being made in our waste package and repository design efforts. The waste package is designed to keep moisture away from the waste. Our design is being supported by tests of the waste package materials under extreme conditions to make certain that the waste package will last for thousands of years. We are preserving flexibility to ensure that design features identified now, as well as those that emerge with advancements in technology, can be accommodated.

Since publishing our last Total System Performance Assessment in 1995, we have continued to conduct informal site performance assessments on a regular basis to help us manage the ongoing science and engineering activities. Our recent efforts have focused on developing the foundation for the Total System Performance Assessment for the Viability Assessment. The Total System Performance Assessment will provide a formal analysis of the expected repository performance at the Yucca Mountain site based on our reference design. This analysis will also provide important insights into the significance of the uncertainties that our science program must address.

All of this work will result in an open and transparent Viability Assessment that gives us a better understanding of repository design and performance in the geologic setting; a better appreciation of the remaining work to prepare a license application; and a more precise estimate of the cost of a repository.

The results of this world-class science and engineering will be contained in documents that will be available on the Internet soon after the release of the Viability Assessment, with all relevant technical and scientific references to follow soon thereafter.

The work we are doing in support of our Nation's nuclear waste management policy is essential not only for disposal of commercial spent nuclear fuel, but also to facilitate cleanup of the nuclear weapons complex and to support the national defense mission. From a global perspective, decisions we make in the U.S. will have impacts throughout the international community. Our continuing endorsement of the international consensus on geologic disposal sets an example for the high standards of environmental protection and nuclear safeguards that we seek to promote worldwide. Geologic disposal also furthers our international nuclear non-proliferation goals.

OCRWM is committed to fulfilling its obligation to all Americans by demonstrating that spent nuclear fuel and high-level radioactive waste can be disposed of in a way that will protect the environment and public health and safety for thousands of years.

Lake H. Barrett, Acting Director
Office of Civilian Radioactive Waste Management

Cross-drift Studies

Mapping:
Full-periphery Geologic Mapping ■ Detailed Line Surveys ■ Geotechnical Data ■ Identify Geologic Features of Significance ■ Describe Ground Conditions in the Northeast-Southwest Drift ■ Provide Comparison to Geotechnical Predictions

Mineralogy:
Analysis of Hazardous Minerals ■ Analysis of Calcites and Associated Minerals

Rock Properties:
Faulting Characterizations ■ Fracturing Characterizations ■ Fault Footwall/Hanging Wall Deformation Predictions ■ Compression Tests ■ Thermal Tests ■ X-Ray Diffraction Tests ■ Grain Density Determinations ■ Measure Rock Stiffness

Hydrologic Tests:
Moisture Monitoring ■ Water potential and Saturation Measurements ■ Construction Water Percolation Measurements ■ Hydrochemistry Analyses ■ Identify Preferential and/or Fast Flowpaths ■ Assess Effects of Variability in Surface Infiltration

Predictive Analysis:
Structural Features (i.e., fracturing/faulting) ■ Unsaturated Zone Hydrologic Flow Model ■ Chlorine-36 Analyses ■ Infiltration, Percolation, and Seepage Tests ■ Fracture Mineral Age Dating ■ Hydrologic Characteristics from Surface Based Testing

Continued from page 1

will compare the predictions to the conditions actually encountered. This will help confirm our understanding of the mountain."

Mapping the rock around the repository, particularly around the Solitario Canyon Fault, is important for identifying potential flow paths for water and radionuclides to the water table below. Scientists want to know how excavation of the cross-drift (or any excavation activity) might affect the rock in the potential repository. Of special concern is the possible introduction of water to the repository block during excavation.

Consequently, as the cross-drift approaches the potential waste emplacement area, scientists will take measures to ensure that excavation does not compromise the potential repository's integrity.

Scientists will conduct five main categories of studies in the cross-drift. These include geologic mapping, mineralogical and hydrological studies, characterization of rock properties and predictive analyses. The predictive category compares the actual conditions encountered in the cross-drift to what researchers expected to find.

Access to alcoves along the main drift of the ESF will not be affected by excavation of the cross-drift, and data collection within the ESF will go on as usual. ■

OCRWM EVENTS CALENDAR
MAY 1998

SAT/SUN	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
					1
2 3	International-Pacific Basin Conference Banff, Canada → 4	5	6	OCRWM Director's Program Review Washington, D.C. → 7	8
9 10	International Conference on Nuclear Energy San Diego, CA → 11 International High-Level Radioactive Waste Management Conference Las Vegas, NV → 11	12	13	14	15
Public Open House Yucca Mt., Las Vegas, NV 16 17	18	19	20	21	22
23 24	25	26	27	28	29

This information is current as of April 29, 1998. Information listed here is obtained from internal and external sources that are considered reliable, but accuracy is not guaranteed. For the most current information, call (202) 488-6720.

OCRWM EVENTS CALENDAR
JUNE 1998

SAT/SUN	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
	1	2	3	4	5
6 7	8	9	NRC/ACNW Meeting Rockville, MD → 10	11	12
13 14	15	16	17	DOE/NRC Quarterly Technical Meeting Las Vegas, NV 18	19
20 21	22	NWTRB Full Board Meeting Las Vegas, NV → 23	24	25	26
27 28	29	30			

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